Overview

High-technology employment is important for a state's continued prosperity. Dramatic improvements in information technology are resulting in higher rates of productivity growth, higher real wages, and lower business costs. Biotechnology is revolutionizing medicine, agriculture, and environmental fields. Miniaturization, new materials and robotics are just some of the advancements changing the way goods are manufactured. Undoubtedly, the success of high-tech industries is crucial in shaping Missouri's international competitiveness and productivity growth, as well as Missourian's standard of living.

Methodology

The U.S Bureau of Labor Statistics, in ***Monthly Labor Review*** June 1999, defined high technology occupations as those most associated with research and development activities. It described high-technology firms as those *"that are engaged in the design, development and introduction of new products and innovative manufacturing processes, or both, through the systematic application of scientific and technical knowledge."* The report also points outs that such firms devote a high proportion of expenditures to research and development activities and employ a large amount of scientific, technical and engineering personnel.

This study takes a very new approach to defining high technology employment, concentrating on the skill sets of workers rather than R&D activities of firms. Both O*Net and OES data are used for this study.

The Occupational Information Network (O*Net) is a comprehensive database of workers attributes and job characteristics. As the replacement for the Dictionary of Occupational Titles, O*Net is the nation's primary source of occupational information. It provides a common language for defining and describing occupations, containing information about the knowledge, skills, abilities, general work activities and work content of different occupations.

Occupation Employment Statistics (OES) is a Bureau of Labor Statistics cooperative program that surveys industries throughout the state. Each year more than 10,000 employers are surveyed through random selection based on their industrial classification, size, and geographical location. The program evaluates employment and wage data by industry and occupation.

For this analysis, occupations are considered high-tech if the following conditions are met:

1. Skill frequency and skill importance is high in programming, mathematics and science.[1] This condition is required because workers in high technology occupations need in-depth knowledge of the theories and principles of science, programming and mathematics.

And…

2. Skill importance and skill frequency is high for at least one of the following--reading comprehension, writing, critical thinking, active learning, problem identification, information gathering, operation analysis, process testing or troubleshooting.

High-Technology Occupations

There are 43 high-tech occupations in Missouri employing 64,630 Missourians and paying an average wage of $60,537 (see Table 1). This is 2.5 percent of all workers in the state and 79% higher than the statewide average wage of $33,800.

Among the highest paid workers in high-tech jobs are those employed in the medical profession, engineering, sciences and information technology. In terms of numbers employed, computer programmers, financial managers, engineering managers, computer software engineers, and family and general medical practitioners are the top five high-tech occupations in the state.

Table 1. High-Technology Occupations in Missouri

[1] O*Net skill importance is set at 4 on a scale of 1 to 5, while skill frequency is set at 5 on a scale of 1 to 7.

SOC Code	Occupational Title	Estimated Employment	Annual Wage
29-1067	Surgeons	540	$143,700
29-1065	Pediatricians, General	340	$119,660
29-1063	Internists, General	1,010	$116,870
29-1064	Obstetricians and Gynecologists	200	$111,150
29-1062	Family and General Practitioners	4,030	$107,230
11-9041	Engineering Managers	4,420	$74,450
19-2012	Physicists	60	$72,080
11-9121	Natural Sciences Managers	740	$71,630
11-3031	Financial Managers	5,600	$68,020
15-1031	Computer Software Engineers, Applications	4,050	$64,600
17-2061	Computer Hardware Engineers	1,120	$63,780
19-2043	Hydrologists	60	$61,320
17-2071	Electrical Engineers	2,950	$60,060
17-2041	Chemical Engineers	1,030	$59,800
15-1032	Computer Software Engineers, Systems Software	3,280	$58,900
17-2199	All Other Engineers	1,400	$55,360
17-2051	Civil Engineers	3,300	$53,570
17-2141	Mechanical Engineers	3,470	$53,340
19-1099	All Other Life Scientists	290	$52,960
29-1131	Veterinarians	920	$52,810
19-2021	Atmospheric and Space Scientists	170	$52,660
15-1021	Computer Programmers	8,750	$51,630
13-2051	Financial Analysts	1,950	$51,570
15-2041	Statisticians	110	$51,270
17-2072	Electronics Engineers, Except Computer	660	$50,550
19-1021	Biochemists and Biophysicists	450	$49,830
13-2031	Budget Analysts	1,090	$49,180
19-1041	Epidemiologists	30	$47,640
25-1052	Chemistry Teachers, Postsecondary	620	$47,220
15-2031	Operations Research Analysts	930	$45,840
19-2042	Geoscientists, Except Hydrologists and Geographers	110	$45,400
19-2099	All Other Physical Scientists	330	$44,810
13-1041	Compliance Officers, Except Agr, Const, Health & Safety, & Transp.	1,970	$44,420
19-2031	Chemists	1,640	$44,380
19-1031	Conservation Scientists	430	$42,480
17-2151	Mining and Geological Engineers, Including Mining Safety Engineers	40	$42,280
13-2011	Accountants and Auditors	1,380	$37,190
17-3022	Civil Engineering Technicians	920	$36,740
19-2041	Environmental Scientists and Specialists, Including Health	740	$36,140
17-3013	Mechanical Drafters	850	$35,420
49-2094	Electrical & Electronics Repairers, Commercial & Industrial Equip.	1,410	$35,130
17-1022	Surveyors	790	$33,960
17-3012	Electrical and Electronics Drafters	450	$32,210
	Total, All High-Technology Occupations	**64,630**	**$60,537**

High-Technology Industries

In this study, high-technology intensive industries are derived from the 1998-2008 industry/occupation (I/O) matrix. Industries that employ significant numbers of O*Net defined high-tech occupations are shown in Table 2. Twenty industries, eleven in services, six in manufacturing, two in transportation, communications and public utilities (TCPU) and one in banking, are found to be high-technology intensive industries.

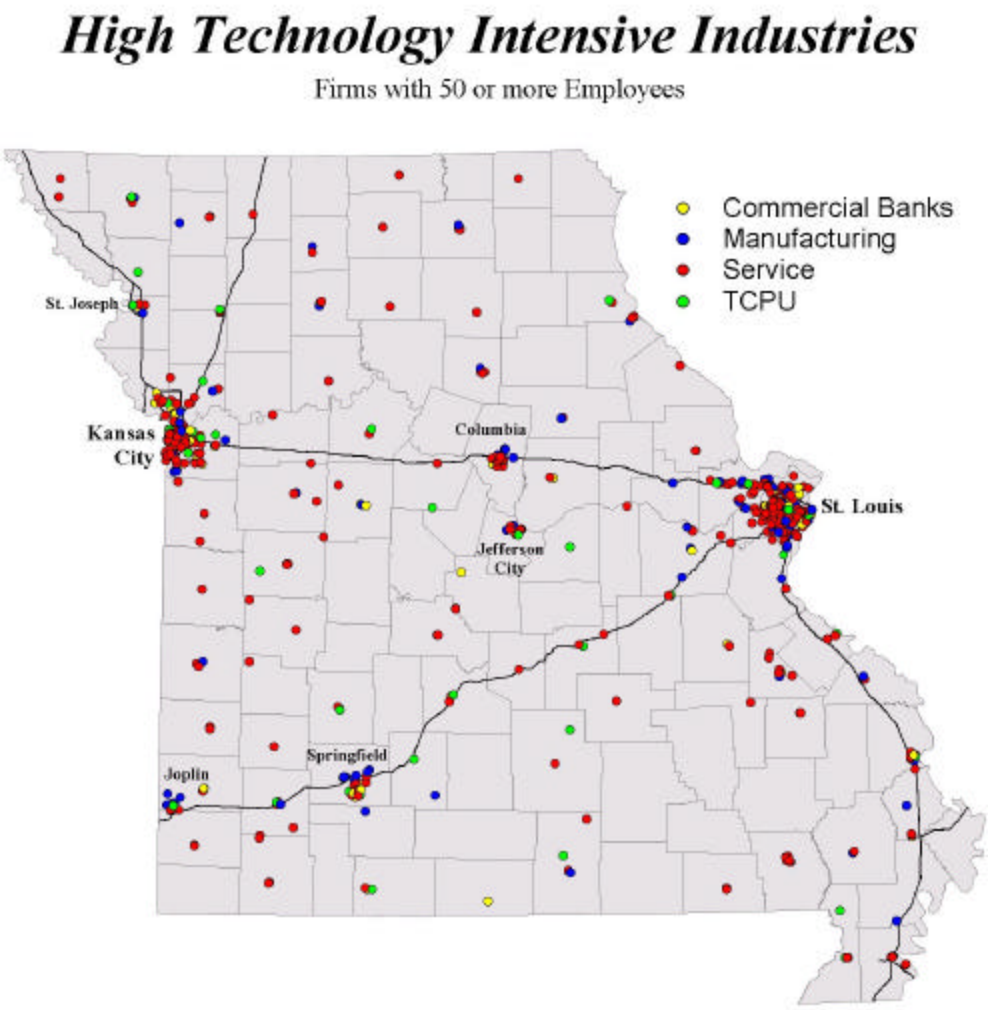
Table 2.

HIGH-TECHNOLOGY INDUSTRIES IN MISSOURI
Industry Title
SERVICES
Personnel Supply Services
Computer & Data Processing Services
Electrical Repair Shops
Offices of Physicians
Hospitals
Educational Services
Engineering & Architectural Services
Research & Testing Services
Management & Public Relations
Services, Necessary
Veterinary Services
MANUFACTURING
Drugs
Industrial Organic Chemicals
Electronic Components & Accessories
Motor Vehicles And Equipment
Aircraft And Parts
Surgical, Medical & Dental Instruments & Supplies
TRANSPORTATION, COMMUNICATIONS & PUBLIC UTILITIES
Telephone Communication
Electric Companies & Systems
BANKING
Commercial Banks

High-Technology Regions

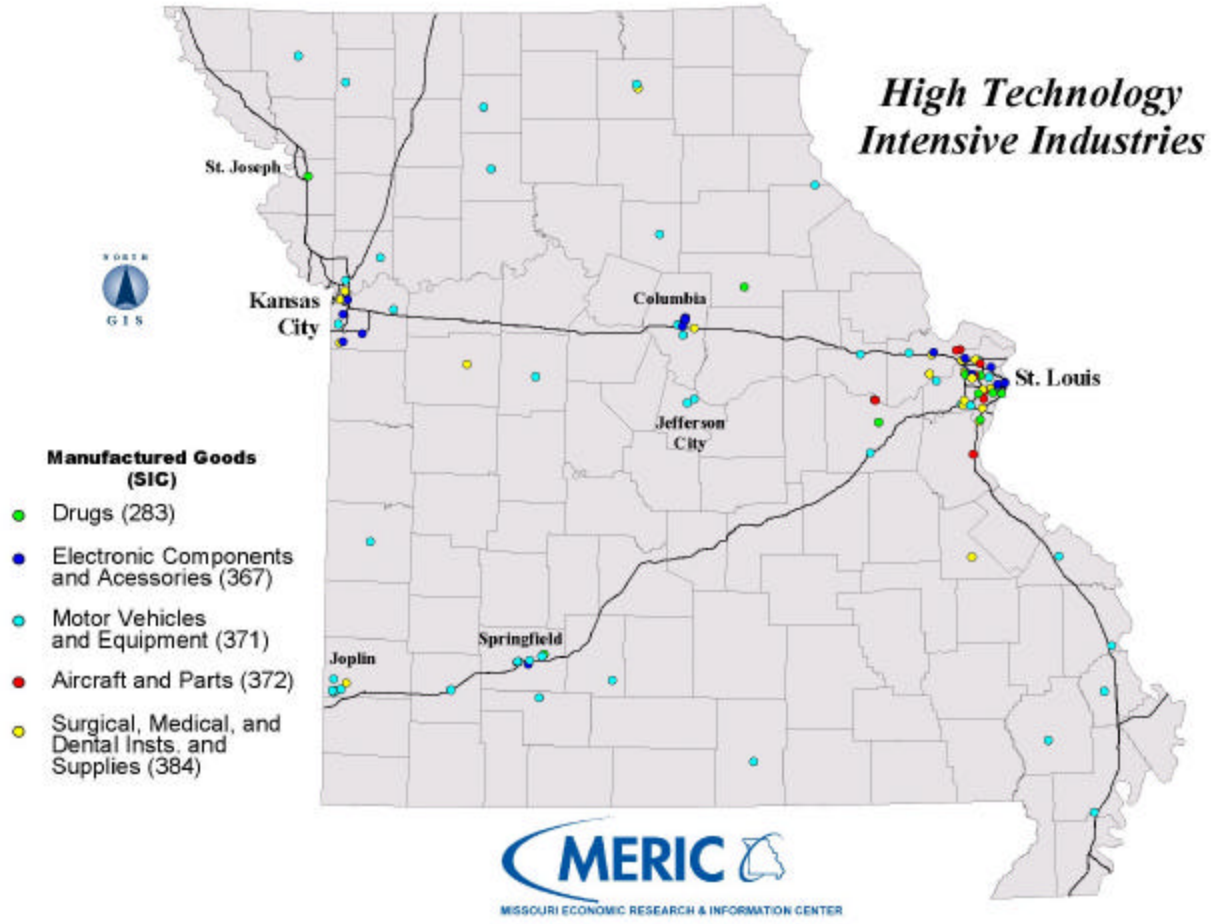
Map 1 shows the statewide dispersion of industries considered high-technology intensive. Many of these industries are concentrated in the large metropolitan areas of St. Louis and Kansas City, but high-technology employment can be found throughout the state.

Map 1.



Map 2 shows the concentration of manufacturing industries defined as high-technology intensive. These advanced manufacturing firms are especially concentrated around St. Louis, Kansas City, Columbia, Springfield and Joplin.

Map 2.



Conclusion

Workers in high technology occupations require in-depth knowledge of the theories and principles of science, programming and mathematics. There are 43 high-tech occupations statewide employing 64,630 Missourians and paying an average wage of $60,537, compared to $33,800 per worker in all occupations. This is 2.5 percent of all workers in Missouri. High-technology occupations are found in all types of industries, both traditional and New Economy, and throughout the state, especially in the metropolitan areas. In particular, twenty industries, eleven in services, six in manufacturing, two in transportation, communications and public utilities (TCPU) and one in banking, are found to be high-technology intensive industries. High-technology employment is important for Missouri's continued economic prosperity.